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(71) Applicant: **IHC HOLLAND N.V.**
NL-3361 EP Sliedrecht (NL)

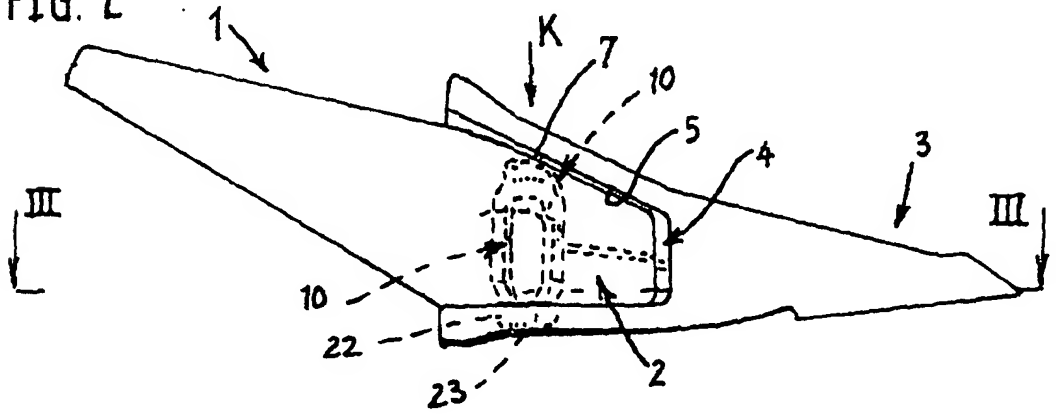
(72) Inventor: **Breken, Roelof**
4207 TD Gorinchem (NL)

(74) Representative: **Lips, Hendrik Jan George, Ir.**
HAAGSCH OCTROOIBUREAU Breitnerlaan 146
2596 HG Den Haag (NL)

(54) **Assembly of a tooth and an adapter for an excavator, such as a cutter or the like**

(57) Assembly of a tooth (3) and an adapter (1) for application with an excavator, such as e.g. a cutter. The parts have telescoping elements (4 and 2, respectively) with tapering surfaces. Recesses (11, 12) for receiving a locking element (10) are made in two abutting surfaces. At least one of said two abutting surfaces (5, 7) of the tooth (3) and/or the adapter (1) has a curved surface as seen transverse to the sliding direction of the parts. Both abutting surfaces (5, 7) can be of curved design with the centres (6, 8, resp.) of the radii of curvature (R, S, resp.) are at the same side of the abutting surfaces and one radius of curvature (S) being larger than the other (R) so that initially the surfaces contact each other according to a line (9).

FIG. 2



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Description

[0001] The invention relates to an assembly of a tooth and an adapter for application with an excavator, such as a cutter or the like, in which the tooth and the adapter have telescoping elements with substantially tapering surfaces and recesses for receiving a locking element are mounted in two contacting surfaces of said elements.

[0002] Such an assembly is known from EP-B-0182357 and is aimed at making it possible to replace a worn or damaged tooth instead of an entire cutter or similar machine part. With said assembly, the planes of the mating elements are in abutment across almost their entire surfaces. This entails that narrow dimensional tolerances should be maintained in order to achieve that the tooth projects beyond the adapter across the desired distance. However, it is desirable that on manufacturing those parts, they require no final processing, or one as small as possible. The parts concerned are generally manufactured by casting or forging.

[0003] If e.g. the cavity in the part to be slid on has a dimension which is slightly too small, sliding will cause difficulties because large frictional forces between the abutting planes will occur. In case of a dimension which is too large, one will not achieve a tight connection between the tooth and the adapter. In both cases, the tooth will possibly not be in the desired position and thus be less effective.

[0004] The object of the invention is to remove these difficulties and to that end provides for, that at least one of two abutting planes of the tooth and/or the adapter has a curved surface as seen in the direction transverse to the sliding direction of the parts.

[0005] With telescoping the parts, now only certain parts of the abutting planes should be pushed away sligthly. Due to this, the desired position of the parts in relation to each other can be achieved more easily. It has turned out that the curved surfaces of one part are slightly deformed elastically on telescoping the parts and adapt to the abutting surfaces of the other part. The frictional forces occurring during sliding-in, will be considerably lower than when the surfaces abut across their entire widths, as is the case with the known assembly.

[0006] Nevertheless, it has been shown possible to achieve a very tight connection between the parts. Further, calculation has shown that on applying the invention a better contact of the surfaces is achieved and that the occurring tensions are lower than with the known assembly.

[0007] In particular, it can be provided for, that both abutting surfaces are designed with a curvature, in such a way that the centres of the radii of curvature of both parts are at the same side of the abutting surfaces and one radius of curvature is larger than the other, in such a way that initially the surfaces contact each other only according to a line.

[0008] Obviously, it is also possible to provide only one of the two abutting walls with a curvature, so that likewise initially the walls will contact each other according to a line. All abutting walls of the parts can be provided with a curvature, but obviously this is not absolutely necessary.

[0009] When the assembly is executed in such a way, that the tooth has a pocket and is slid onto the adapter, the latter can be provided with wedge-shaped cams to facilitate removing a tooth from the adapter.

[0010] Further, the adapter can be provided with cams for indicating the position where the tooth must be located on the adapter. Then, the tooth can be prevented from being slid onto the adapter too far.

[0011] With the known assembly, a bent thread of spring steel is employed as locking element. This has the difficulty, that the locking element only locally abuts the walls of the recesses in the surfaces concerned of the tooth and the adapter. Due to the open shape of the element, during operation of the device, sand and clay will collect and solidify there, even if the element will often be located largely under water. Removal of the element afterwards with replacement of a tooth may then cause difficulties. Namely, the element must be compressed slightly in order to be able to pass the relative small openings above or below the recess.

[0012] In this aspect too, the present invention intends to provide an improvement, in that the locking element is assembled from two substantially L-shaped strips, with one set of legs thereof extending in parallel and being spaced apart with interposition of an elastic body, and the other legs fall around said elastic body and that in such a way that one leg lies on the other.

[0013] The mutually parallel legs of the strips largely abut the walls of the recesses in the tooth and the adapter. Since at the other side the legs abut the elastic body, they can be pressed towards one another to a degree sufficiently for moving the locking element into the recesses intended for it. At both sides of the recesses, into which the locking element should fall, there are narrow holes through which the locking element should be pushed when it is to be brought into the recesses. The holes are narrow so that the locking element can not be removed from the recesses in an uncontrolled way.

[0014] On bringing the locking element into the recesses, one operates in such a way, that the free ends of the parallel legs of the strips are pressed towards one another in order to be brought into a hole. After that, the upper leg of the one strip can be hit upon in order to move the locking element further inwards. Owing to the fact that said leg, which is hit upon, bears on the leg of the other strip, both strips are moved inwards simultaneously, so that no shearing forces will be exerted on said elastic body.

[0015] For bringing the locking element into the recesses with ease, the free ends of the parallel legs of the strips will be bent in such a way, that across a certain distance they will lie closer to one another than where the major portion of the elastic body is located. Then,

after mounting of the locking element, the parts being closer together will be pressed against the edges of the hole situated adjacent the recesses.

[0016] Enclosing of the locking element in the recesses can be improved in that the leg of the other strip lying on the leg of the one strip, through a bent portion, will continue into the other leg of the same strip. Said bent portion of the strip of the locking element will provide for that this strip will leave the hole positively when the locking element has largely passed the hole. The strip will then be pressed against the wall of the reces by the elastic element so that the locking element will no longer be able to perform a return movement.

[0017] When the locking element should be removed from the recesses, for the purpose of replacing a tooth, a tool can hit on the same leg as with insertion of the locking element. Then, likewise no shearing forces will be exerted on the elastic body.

[0018] The invention is further explained by way of an example, illustrated in the drawing, in which:

Fig. 1 shows schematically a plan view of the assembly according to the invention;
Fig. 2 shows schematically a cross-section according to the line II-II in Figure 1;
Fig. 3 shows schematically a cross-section according to the line III-III in Figure 2;
Fig. 4b shows schematically a cross-section according to the line IV-IV in Figure 1;
Fig. 5 shows schematically a part of Figure 4 on a highly enlarged scale;
Fig. 6 shows a lateral view, on an enlarged scale, of the locking element applied with the assembly according to the Figures 1- 5; and
Fig. 7 shows a cross-section according to the line VII-VII in Figure 6.

[0019] The assembly illustrated in the Figures comprises the adapter 1 provided with a receiving portion 2 and a tooth 3 mounted on it, to that end being provided with a cavity 4. In a way not further indicated, the adapter 1 is releasably or otherwise connected to a part of the excavating machine, such as a cutter, for example.

[0020] As appears in particular from Figures 1 - 3, the abutting walls of the receiving part 2 and of cavity 4 are tapered towards one another in longitudinal direction of the parts 1 and 3.

[0021] Figure 4 shows a cross-section across the receiving part 2 and the tooth 3 where the cavity 4 in the tooth 3 is located. As appears from Fig. 5 in particular, the wall 5 of the cavity 4 has a curved shape, with the centre 6 of the radius of curvature R being located at a considerable distance from the wall 5. Wall 7, located opposite the wall 5, of receiving part 2 has a radius of curvature S being slightly larger than R and having its centre indicated by 8. Walls 5 and 7 will basically contact one another according to the line 9 at the beginning of telescoping of the parts. On telescoping further, the parts located adjacent the line 9 will also contact each other as a result of elastic deformation. The parts being located adjacent the line 9 need only have a limited width in order to have a sufficiently high enclosing force between the parts. Due to that, the friction between the parts will remain limited, so that sliding-in can take place relatively easy.

[0022] A locking element 10 is employed for guaranteeing a positive enclosure of the parts in relation to one another. At one side, the element 10 abuts the wall of a recess 11 in the receiving part 2 and at the other side it abuts a wall of a recess 12 in the tooth 3, at the position of the cavity 4 in it.

[0023] As appears from Figures 6 and 7 in particular, the locking element is formed by two L-shaped strips 13 and 14 having their legs 15 and 16 respectively extending in parallel and being connected to one another by an elastic body 17, consisting of rubber or a similar material, for example. The legs 15 and 16 of the strips can be provided with ribs 18, see Figure 7, for establishing a firm connection between the strips and the elastic body 17. With a bent part 19, leg 15 of the strip 13 passes into the leg 20, abutting the outer side of the leg 21 of the strip 14. The free ends of the legs 15 and 16 are provided with flanged parts for forming two parts 22 being closer together. After sliding the locking element 10 into the recesses 11 and 12, parts 22, under compression of the elastic body 17, will abut the receding walls of a hole 23 situated below the recesses, as appears from Figure 2 in particular.

[0024] Above the recesses 11 and 12, there is also a hole 23, and both holes have smaller dimensions than the recesses. As stated above, the locking element 10 will be pushed through the uppermost hole 23 as seen in Figures 2 and 4, in which a hammer can be employed for exerting a force K, as indicated in Fig. 2. On removing the locking element from the recesses, a force in the same direction will be exerted on the locking element.

[0025] As appears from Figure 1 in particular, the adapter 1 can be provided with wedge-shaped cams 24 for removing a tooth 3 from the adapter.

[0026] Removing the tooth from the adapter can take place by hitting on the back side of the tooth, namely alternately on its various edges. However, when the cams 24 are present, a two-teeth wedge-shaped fork can be driven between these cams and the back side of the tooth in order to release the tooth from the adapter. In most cases, this makes releasing the tooth easier and less time-consuming.

[0027] It is also possible to apply cams 25 for preventing a tooth from being slid onto the adapter too far and for checking if the tooth is located in the appropriate position.

[0028] When a tooth would be slid onto the adapter too far, the material of the tooth might get overstretched. The tooth would then be clamped onto the adapter too tightly and get under high tension. This might lead to premature failure of the tooth due to cracks or to prema-

ture failure of the adapter d[redacted]clamping forces.

[0029] It will be obvious, that only one possible embodiment of an assembly according to the invention has been illustrated in the drawing and explained in the description and that many changes can be made without leaving the inventive idea as it has been described in the claims.

Claims

1. Assembly of a tooth (3) and an adapter (1) for application with an excavator, such as e.g. a cutter in which the tooth and the adapter have telescoping elements (4 and 2, respectively) with substantially tapering surfaces and recesses (11, 12) for receiving a locking element (10) are mounted in two contacting surfaces of said elements, **characterized in that** at least one of two abutting surfaces (5, 7) of the tooth (3) and/or the adapter (1) has a curved surface as seen in the direction transverse to the sliding direction of the parts.

2. Assembly according to claim 1, **characterized in that** both abutting surfaces (5, 7) are designed with a curvature, in such a way that the centres (6, 8, resp.) of the radii of curvature (R, S, resp.) of both parts (4, 2, resp.) are at the same side of the abutting surfaces and one radius of curvature (S) is larger than the other (R) , in such a way that initially the surfaces contact each other only according to a line (9).

3. Assembly according to claim 1 or 2, **characterized in that** the tooth (3) has a pocket (4) and is slid onto the adapter (1), **characterized in that** the adapter (1) is provided with wedge-shaped cams (24) to facilitate removing a tooth from the adapter.

4. Assembly according to claim 3, **characterized in that** the adapter (1) is provided with cams (25) for indicating the position where the tooth must be located on the adapter.

5. Locking element for application with the assembly according to one of the preceding claims, **characterized in that** the locking element (10) is assembled from two substantially L-shaped strips (13, 14), with one set of legs (15, 16) thereof extending in parallel and being spaced apart with interposition of an elastic body (17), and the other legs (20, 21) fall around said elastic body and that in such a way that one leg (20) lies on the other (21).

6. Locking element according to claim 5, **characterized in that** the free ends of the parallel legs (15, 16) of the strips (13, 14) are bent in such a way, that across a certain distance they will lie closer to one another than w[redacted]he major portion of the elastic body (17) is located.

7. Locking element according to claim 5 or 6, **characterized in that** the leg (20) of the other strip (13) lying on the leg (21) of the one strip (14), through a bent portion (19), will pass into the other leg (15) of the same strip (13).

FIG. 1

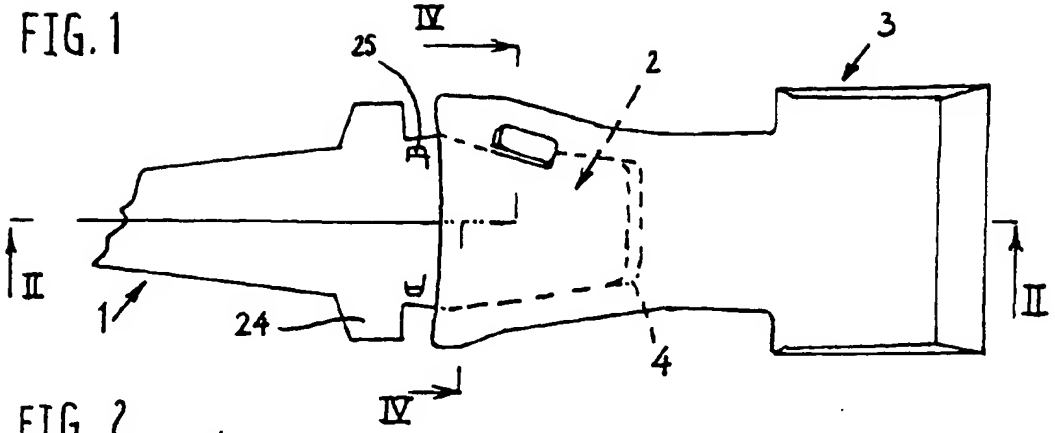


FIG. 2

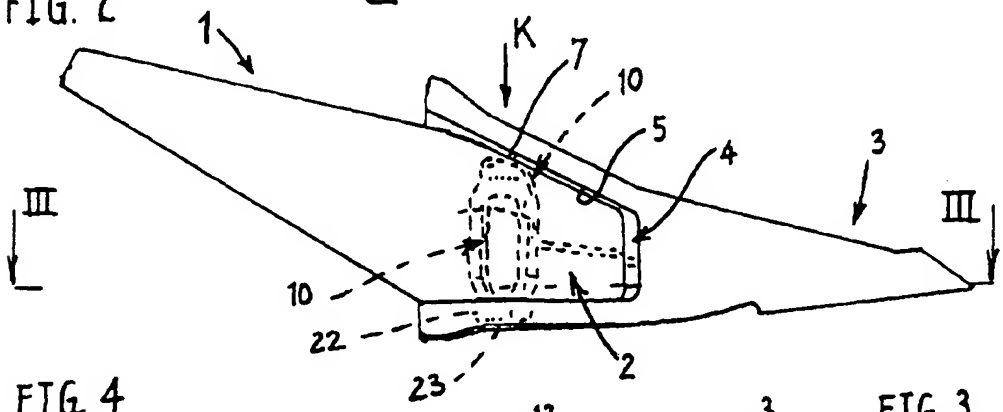


FIG. 4

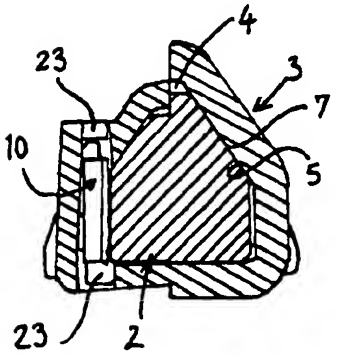
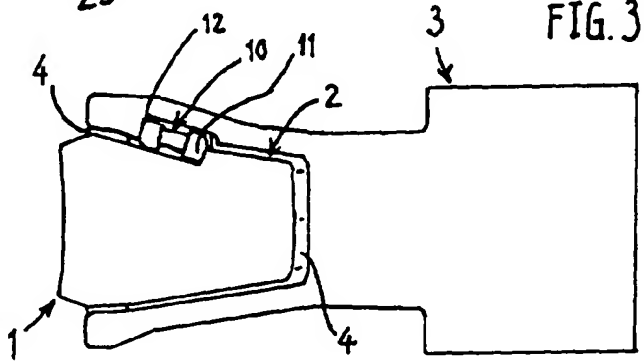


FIG. 3



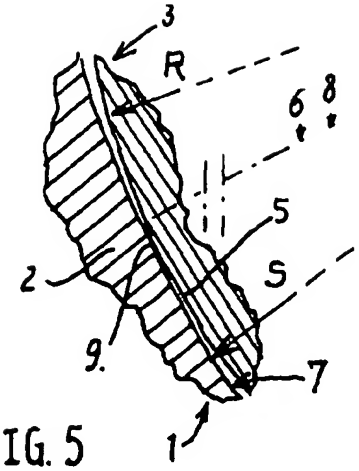


FIG. 5

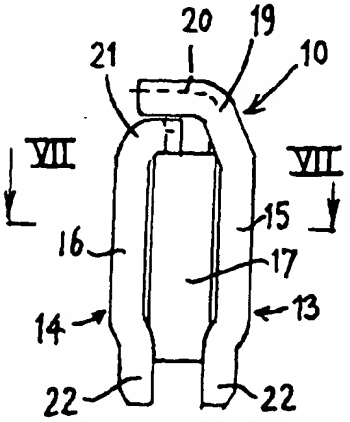


FIG. 6

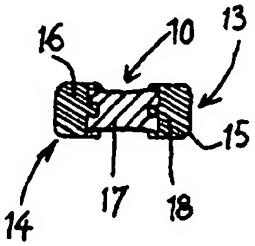


FIG. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 01 20 2733

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12 October 2001	Guthmuller, J

CATEGORY OF CITED DOCUMENTS

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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12 October 2001	Guthmuller, J

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